pletely of his knowledge and experience, and I carry with me today some very important impressions as a result of this association.

In the first place, the presumptive evidences of tumor of the bladder are rarely definite. Bleeding is a sign so frequently in other conditions than tumor and frequency of urination or other disturbances of urination accompanies other conditions even more frequently so that symptomatically can tumor of the bladder rarely be diagnosed. The one and only positive finding, other, of course, than that from cystotomy, is the cystoscopic one, and, clinically, Geraghty was always accustomed to differentiate two distinct types of bladder tumor; the one was papillary and most frequently multiple, the other was a sessile and infiltrating flat type tumor and occurred usually singly. The papillary tumors were distinctly of three types: First, the benign papilloma, second, the malignant papilloma and, third, the papillary carcinoma, the distinction being very simply that there was no cancer in the first, that in the second the malignant degeneration was confined to the body of the polyp and in the third that the malignancy was infiltrating the base and bladder wall, but clinically the three types were conveniently associated because the initial treatment of all three was the same, namely fulguration. The second single infiltrating sessile type tumor comprised the vesical carcinomatas in which fulguration is usually useless. The cystoscopic differentiation of these two types is usually simple and it must always be borne in mind that a papillary tumor is potentially malignant even though it is not a papillary carcinoma. Attempts to remove fragments with a cystoscopic rongeur are, as a rule, not of much assistance in the diagnosis between a benign and malignant tumor except when such fragments are definitely malignant; negative findings are valueless for the fact that the fragment may have well come from a benign area.

In a plan of treatment of bladder tumors the above clinical differentiation of Geraghty's is a great help. The initial treatment of all papillary tumors, irrespective of its being any one of the three types mentioned, is fulguration and, according to the immediate responses, the use also of radium and x-ray. One very important factor in the treatment of this type of tumor is follow-up treatment and periodic observation and inspection for long periods after the initial treatment. The next line of treatment in these cases is that of resection surgically after the cautery method of Edwin Beer of New York in all papillary type tumors which do not readily disappear under fulguration, radium and x-ray. In the sessile or infiltrating type tumor the first consideration is whether the tumor is operable or inoperable and this surgical consideration is concerned not only with the amount of mutilation so far as the bladder itself is concerned, on account of its site, but is also concerned with the clinical condition of the patient as to age and surgical risk. If operable under these considerations, radical resection, after the cautery method of Edwin Beer, should be given preference, it always being understood that at the time of operation radium implantation is used and that proper x-ray treatment is given afterwards.

Under this head of operable tumors, I believe, there is a distinct field of usefulness for even the radical one of extraperitoneal cystectomy with suprapubic ureteral drainage as advocated by Judd or, according to the operative conditions at the time, uretero-rectal implantation. In the second inoperable group of infiltrating tumors fulguration, radium and x-ray should be given second choice and cystotomy and nephrostomy third choice as purely palliative measures.

Under the above plan of diagnosis and treatment of bladder tumor, it is seen that the most important factor that will give the optimum result is early diagnosis, and cystoscopy can now be recognized as the one method of making an early diagnosis, so that every case in any way suspicious should be immediately cystoscoped.

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Men who cannot be beaten, though they fail a score of times, men who cannot be discouraged by an army of difficulties, sometimes go tumbling down as a result of a little success. More men are failures on account of success than on account of failure.—Dearborn Independent.

## CHRONIC BACK PAIN FROM A MECHANICAL POINT OF VIEW

*By* JOHN DUNLOP, M. D., *Los Angeles*

*Faulty mechanics of the lumbosacral joints are more responsible for backache than are the sacro-iliac joints.*

*There are very few sacro-iliac injuries which are not accompanied by lumbosacral injury.*

*A very careful history will usually show that most backaches are initiated by an acute onset.*

DISCUSSION *by Alfred Roncovieri, San Francisco; Maynard C. Harding, San Diego; William Lisle Bell, Oakland; Harold H. Hitchcock, Oakland.*

IT IS always a matter of surprise to me that the importance of faulty mechanism of the spine as a cause of chronic back pain is not more frequently recognized. I say this reservedly, for I appreciate that the specialist is often criticized for diagnosing a condition as falling into the category of his own special line. However, when a certain type of case comes very frequently under the observation of the specialist it is natural that he should be impressed by the importance of a correct understanding of it.

Chronic back pain, from a mechanical point of view, has held the attention of the orthopedic surgeon since Doctor Goldthwait's first paper in 1905, concerning the relation of the relaxation of the sacro-iliac joints to instability of the back. I have been fortunate enough to be in a position to observe the entire development of the subject of back pain from the orthopedic standpoint, and since the early days my ideas have undergone considerable change. I was one of those who (twenty years ago) attributed almost all the backaches to the relaxation of the sacro-iliac joints. For the last twelve years, however, I have felt that faulty mechanics of the lumbosacral joints were more responsible for the trouble than were the sacro-iliac joints, and the more I have been able to study my cases, especially with very carefully made stereoscopic x-ray examination, the more positive I feel that the lumbosacral joints are at fault in the great percentage of cases. In fact, I feel that there are very few sacro-iliac injuries which are not accompanied by lumbosacral injury.

When we take into consideration the spine and pelvis and their mechanical construction, we wonder that these very delicately constructed joints are not more frequently the subject of injury.

We might stop here to explain what we mean by injury. Most of the injuries are of a subtle nature; I should say strains from a disturbance of relations at the joint surface. I mean a relaxation or stretching of the ligaments holding such joints in their normal relationships: by sprains, I mean a definite tearing of tissues, which would allow abnormal freedom of movement. There is no question in my mind but that many of these acute cases, or those with acute onset, are due to sprains. Further, when the relaxation is sufficient, there can be no question about the increased amount of mobility possible in the joints, even to the point of dislocation, and we must feel that a number of these badly contused cases are fractures, fresh or healed.

In addition to injuries, we must take into consideration the diseases which are of a chronic nature and can inflict injury on joints and cause somewhat similar symptoms. Hypertrophic or infectious ar-

thritis are probably the more responsible causes, but we must remember that we are dealing with true joints in every respect and that they are subject to every disease that any other joint is subject to, and therefore the whole category of possibilities must be considered.

A very careful history will usually show that most backaches were initiated by an acute onset. The patient can almost always say just when the trouble started. In Dr. Goldthwait's early cases, which were those following delivery, the trauma was unquestionably due to the act of child-bearing, and from that time on the patient was conscious of a difference. It is my opinion that in all of those cases connected with obstetrical conditions there are sacro-iliac relaxations or injuries and, no doubt, most of those first cases reported by Dr. Goldthwait were of that nature. There is, undoubtedly, a large class of cases where the relaxation of the supporting ligaments to the sacro-iliac joints is so extreme that true motion exists in one or both sacro-iliac joints. This is especially so in the cases where there is so much difficulty following childbirth.

There is another class of cases belonging in this category to which I wish to draw attention, because they have been little understood. I refer to the cases of women who have backache accompanying the normal or abnormal relaxation during menstruation. This relaxation is, in my opinion, definitely due to the softening of the ligaments supporting the sacro-iliac or pelvic joints prior to, or accompanying menstruation, due to a more copious supply of blood to all of the pelvic structures at such a time; another reason why those so afflicted should remain quiet, in order to avoid strain during this period.

As one's experience grows, it appears more evident that post-parturient or delivery injury forms but a small percentage of the cases under discussion. Persons who are subjected to any activity which places a more than ordinary load on the spinal articulation are liable to this injury. I personally believe that among people who have lived to middle age there are few who have not suffered sufficient injury of some spinal or pelvic joint to have had symptoms therefrom.

The more common symptoms of such a condition are sciatica and lumbago. Victims of these so-called maladies often suffer acutely and continuously, and it is astonishingly difficult to convince most of them that their sufferings can be quickly and completely relieved by a skilful treatment of the mechanism of the joints. We should emphasize our assurance to such patients that prompt and complete relief can be obtained, usually by simple means, and that invalidism is unnecessary. This advice should be disseminated, not only among those who have followed mistaken methods of treatment, but also among that class of industrial cases who, rather than work in good healthy surroundings for a living, seek the existence allowed for disability by our State Compensation laws.

It is quite easy to appreciate the signs and symptoms of low back injury of the lumbosacral area when we consider the lumbosacral joints. They are shallow, about half an inch in diameter, irregular in shape and faceted. It is by means of these little facets that practically all the motion between the trunk and the lower part of the body takes place. In the ordinary way in which we use our bodies it is easy to understand how strains can take place in this location, because there is so little protection against them.

Papers written in recent years by anatomists establish the variations in anatomy of the low part of the spine and the pelvic articulations. Under such conditions it is difficult what is normal or what constitutes normal function. Many of us feel that the greater the departure from what we have considered normal, the more pronounced and uncertain are the consequences of injury. We do know that most of the understood signs point more often to the lumbosacral or sacro-iliac than to the intervertebral articulation higher up. This conclusion also is supported by our anatomical observations. The joints higher up than the fourth lumbar run pretty close to standard construction and lend themselves very little to joint injury.

It may be well to enumerate some of the possible traumatic injuries: bad posture; that is, any position which will put the lumbosacral or sacro-iliac joints on a strain. Flat back; pendulous abdomen with lordosis; short leg; scoliasis, paralysis, are examples. The former faulty dress of women was often responsible for faulty attitudes; such as improperly constructed corsets and improperly balanced shoes. The harm produced by faulty dress has, with present styles, been almost eliminated, and there has been considerable improvement in shoes, although they still form a definite etiological factor.

Knowledge of the usual antero-posterior spinal curves is necessary in order to be able to judge of lordosis or flat-back, which is so predominant and prevalent in backaches due to postural defects. Occupational injury may be very slight and yet be a factor in producing backaches. The use of the joint in a slightly unprotected position over a long period of time, causing a constant stretching or irritation of the joint may be all that is required. Riding in an automobile in a faulty position is a common example. Sitting in a chair of uncomfortable height; standing slightly stooping in any type of work, or flattening of the back on the operating-table when the patient is completely anesthetized, may produce trauma. These are types of injuries which are unnoticed by the patient at the time of injury.

### SLIGHT TRAUMA DUE TO SUDDEN OVER-STRETCHING OF THE JOINTS

This, I believe, is the largest group of causative agents of backache. One suddenly moves in a certain way, or meets an unexpected resistance to motion, there is a stitch in the back and one has difficulty in straightening up, the pain being always located at the lumbosacral area. Examples of this may be very slight or very severe. In former papers I have noted some of the most severe types.

The point I want to emphasize is that we are dealing with abnormal joints, the result, in a great majority of cases, of injury, and that these injured joints are not functioning normally, and that through this abnormality of function certain symptoms develop.

I will enumerate: Backache, with pain, located usually at the lumbosacral level, at times distinctly

down the line of the sacro-iliac joint. On abdominal examination, we frequently find tenderness on pressure over the sacro-iliac joints.

There may be referred pains from disturbance of posture or from nerve irritation. Those from disturbance of posture are usually referred up the spine, especially to the back of the neck, but may be quite bad in the mid-dorsal area. Those troubles from referred pains are usually sciatica, pain in the hip-joint, in the sacro-sciatic notch, coccyx, in the low abdomen and groin, and down the outer side of the leg; pain associated with constipation and filling of the large bowel, causing pressure on the sacro-iliac joints in front; and pain directly associated with menstruation at the time when the pelvic ligaments are naturally softened.

The *physical signs* of mechanical disturbance are: Obliteration of the lumbosacral curve; obliteration of lumbosacral fossae; prominence of sacrum; asymmetry of the lumbar and sacral region; prominence and spasm of the lumbar muscles, usually unilateral; restriction of motion in the low spine; restriction of straight-leg lifting; restriction of hyperextension of the hip-joint; usually *little* restriction of the flexed hip in either direction, or complete flexion of hip; tenderness on pressure over the irritated joints, both from behind and through the abdomen, and also from a rectal or pelvic examination; restriction of all movements producing movement of the low spine, such as arising from bed with legs straight, causing pull of the hamstring muscles; rising from the sitting position, stooping; lying in bed, with too much sag, thereby obliterating the normal lumbar curve, as in long protracted illness and fractures.

In accepting faulty posture as one of the frequent causes of backstrain, we must not lose sight of the fact that disturbed foot balance, by throwing the body out of correct alignment, may be a large factor in the production of backache. The normal relations of weight-bearing surfaces of the joints are disturbed, and mechanical irritation is thereby produced.

Much has been ascribed to the sacro-iliac joints which, I think, could well have been ascribed to the lumbosacral joints. There is a condition due to acute trauma which, to my knowledge, has never been so described. I have demonstrated this both from an x-ray standpoint and by clinical observation. It is a rotation of one innominate bone. For such an injury to take place there must be an accompanying injury of the symphosis and one sacro-iliac joint. In those cases where I believe this to have taken place the amount of rotation is, I believe, very slight, but definite enough to make a distinct difference at the pubis and the ilium and the ilium and sacrum on one side. With very carefully taken stereoscopic rays in more than one plane where the findings are identical, I believe such a lesion can be demonstrated. And manipulation done under anesthesia, with the idea of rotating the innominate bone, produces immediate results, which convince me of the correctness of the observation. With such a manipulation there is the feeling and audible demonstration of a click, and on the awakening of the patient the pain is gone. I have plates which, when carefully examined in a stereoscope, will prove my contention. Unfortunately, these stereoscopic plates cannot be demonstrated on a screen. This lesion is necessarily a true sacro-iliac injury.

Treatment must be attacked as the treatment of injury in any other joint would be attacked; that is, rest through the acutely irritated stage; restoration of relationship by manipulation or, if necessary, operation of the affected joint; gradual return of function without producing pain, the latter usually with the use of some form of fixation in order to prevent further irritation; local improvement of muscle and ligamentous tone and improvement of local circulation; correction of posture by use of apparatus or physical development.

## CONCLUSIONS

I. That chronic back pain is very often the result of disturbed mechanics of the bones and joints of the spine and pelvis.

II. That normally constructed joints of the spine and pelvis, when subjected to extraordinary stress, are liable to injury just as are other joints of the body.

III. That in subjects where the normal tone of the ligamentous structure has been lost unusual movement in the joints is possible and the ordinary stability is lacking, with accompanying strain (of the entire mechanics dependent upon it); or there may even be such relaxation that dislocation may be possible.

IV. That the disturbance of the normal mechanics is frequently due to abnormalities or asymmetrical developments of the spinal and pelvic zones, and more especially due to the formation of the joint surfaces between the spine and pelvis known as the lumbosacral articulations, which lend themselves more readily to injury when subjected to any unusual uses to which they may be put. That unless the mechanical defect is corrected pain remains, due to a true mechanical irritation within the joint. In the cases caused by relaxation the tone of the supporting tissue must be supported and built up to enable them to do their usual work. In the cases where there has been a true change in the relation of the joints, the normal relation must be restored before the supporting and building up process is instituted. In the cases where anatomical construction is at fault, in addition to support during the irritated stage, the patient must be instructed in the use of the body in such a way as to prevent strain and irritation.

V. That most carefully trained physical directors who fully appreciate the work in hand should be employed, and should work wholly under the supervision of the physician.

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## DISCUSSION

ALFRED RONCOVIERI, M. D. (Flood Building, San Francisco)—Doctor Dunlop has presented an interesting paper on an important subject. After ten years of active industrial surgery, I know of no other type of disability which presents such a problematic outcome from the standpoint of response to treatment and recovery. It seems to me, as Dunlop has suggested, that there has been a general lack of understanding as to the mechanics of back strains, as well as the pathology and treatment.

I am particularly struck with Dunlop's summary of back injuries, with particular reference to the finer shades

of interpretation between strains and sprains, which, I think, admirably covers the situation.

I concur with his opinion regarding the likelihood of most low back injuries being lumbosacral rather than sacro-iliac in origin and pathology. Aside from the fact that clinically we can demonstrate this to be true in the majority of cases, it also seems reasonable from a consideration of the anatomy and structure of the region. The lumbosacral articulation is a true joint, movable and exposed to injury much more pronounced than the sacro-iliacs which, anatomically, are not true joints, but synchondroses. I have always felt that it is mechanically almost impossible to get ordinary strains of the sacro-iliacs without some degree of sub-luxation. Luxations of the joint, even in slight degree, can now be positively demonstrated by radiograms which should show a distinct altered relationship of the symphysis.

I am sorry Doctor Dunlop did not go into the matter more fully of operative treatment for true sacro-iliac pathology, both traumatic and non-traumatic. From my observation of patients coming under my care during the past two or three years, and with a review of the literature, I am becoming convinced that a well-performed sacro-iliac arthrodesis by the Smith-Peterson procedure gives the best and most practical means of eventual recovery in these troublesome cases, particularly referring to the definite luxated or diseased types. Though frequently tried, and at times with relief and improvement, manipulation and immobilization rarely seem to have produced the desired results in my hands.

Unquestionably postural deformities predispose to low back strains, and prolong recovery, as Dunlop has pointed out.

The question of a complicating osteo-arthritis is also another disturbing factor, which, in my experience, has always aggravated more severe back strains, and has prolonged the milder types.

MAYNARD C. HARDING, M. D. (Electric Building, San Diego)—Doctor Dunlop's excellent paper opens so many lines for discussion that one must leave out much that he would like to say. Two points are uppermost in my mind.

The first is in regard to x-ray. After ten years of checking up hundreds of cases of back pain with the x-rays of normal cases, I am forced to the opinion that it is rare, indeed, to get positive x-ray findings in sacro-iliac pain. The low lumbar pains give a slightly higher percentage of positives.

The second point is in regard to the technique of examination. I wish that Dunlop had given us, from the fullness of his experience, his exact methods of examination. I believe that most of the poor diagnoses of back pain are due to slovenly methods, and I, for one, am unable to arrive at a diagnosis with any certainty until I have gone through my entire procedure.

A few months ago I visited a large number of orthopedic hospitals in the East, and in not one did I see a back examined with sufficient thoroughness to warrant the diagnosis arrived at. I feel it is for orthopedic surgeons to lead the way in instructing the profession at large in the methods of diagnosis and treatment of these distressing patients who come to us all.

WILLIAM LISLE BELL, M. D. (1327 Broadway, Oakland)—It has been a pleasure to go over the paper of Doctor Dunlop. He certainly knows his subject and I, too, am only sorry that he could not have had more space to devote to treatment. A paper of this sort necessarily covers so much territory that one must conserve somewhere.

As early as 1908 I had convinced myself that lumbosacrals comprised the volume of lower back injuries and have even gone so far as to say publicly once or twice that I thought sacro-iliacs constituted not over 5 per cent. So I cannot very well disagree with Dunlop on this score. I am convinced also that, were we able to have patients with back injuries within twenty-four or at the most not over forty-eight hours from time of trauma, with proper distraction, relaxation, and fixation, very few of them would go on to a prolonged chronic condition. Many of them are untreated for years and worse than that, many of them go to the ignorant manipulators who pretend to adjust.

One point mentioned to me by a famous old Vienna physician twenty years ago is intra-abdominal gas pressure, mechanical pressure, with its consequent intestinal toxaemia. As to softening of the sacro-iliac ligaments during menstruation and consequent relaxation, well, I shall have to be a trifle disagreeable and say to Doctor Dunlop that my own view of this angle inclines more to a general edema in this region at this time, with its extension, no doubt, to the somewhat predisposed nerve structures. And then, to my mind, one of the most prolific causes of low grade back discomfort, that type which is more or less continuously present and often quite discomforting during sudden extensive excursions of the spine, is not a muscle spasm, is not an inflamed nerve, is not a disarranged column, but the chronic fibrosis, or better still the chronic inelasticity of certain groups of muscles that have degenerated in their continuous effort at splinting.

These muscles are not often palpable, and do not seem rigid except when distracted by the opposing group, but they do have very limited extensibility and do effect a decided pinching when their elastic limit has been reached through contraction of the counter group. It is in these cases that deep thorough intelligent massage helps, but massage alone cannot relieve this condition without active and oft-repeated stretching on the part of the patient himself.

HAROLD H. HITCHCOCK, M. D. (1904 Franklin Street, Oakland)—The mechanics of the back are certainly a great factor not only in causing back pain, but in keeping on going after it has once started.

In the figures obtained by Roger Lee and Lloyd Brown at Harvard, and the University of California Infirmary, examining freshmen students, it was found that 75 per cent of all male freshmen have very poor body mechanics. If this is true of these young men, the pick of the country, it must also be true of those outside of our colleges.

I believe that long-continued tilting the pelvis forward, slumping the upper trunk backward and hanging the head forward, an attitude of fatigue, gives rise to contractures in the psoas and rectus femoris muscles, as well as other smaller muscles that makes it almost impossible for many people to tilt their pelvis backward and decrease their lumbar curve, just as foot drop gives contracture of the calf group.

The muscle balance in the low back is thereby upset just as a short heel cord will upset the muscle balance in a foot, and much extra work is put on the small lumbosacral joints which should be taken care of by normally balanced muscles. Many of these injuries will not clear up until this balance is restored. I regret that Dunlop could not give more space to his corrective procedures.

Young men who are using their bodies mechanically incorrectly constitute one of the biggest problems at the University of California Infirmary. Their x-ray findings are usually negative, they do not improve until their whole mode of living is corrected, which includes their bed, automobile, their chairs and their way of standing, walking and using their bodies.

I have not been able to visualize ligaments relaxing and stretching as a result of increased congestion of the pelvis vessels.

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**Curve of Inorganic Blood Phosphates During the Sugar Tolerance Test; Significance in Diagnosis and Prognosis**—F. W. Hartman and Adolph Bolliger, Detroit (Journal A. M. A.), assert that the effects of insulin on phosphate utilization are comparable to those on carbohydrate utilization. Abnormal carbohydrate metabolism may be divided into seven groups by means of the blood phosphate curve. Slight abnormalities and the functionless pancreas are readily identified through the phosphate curve. Abnormal carbohydrate metabolism associated with the pituitary, and possibly with the suprarenals, may be recognized.

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**What do you think about the suggestion that has been made, to make drug addiction a reportable disease?**